

# Welcome to the 2021 Online HYSPLIT Workshop (DAY 2 of 4)

The broadcast is scheduled to start at:  
09:00 Eastern Daylight Time (EDT) = 13:00 UTC

NOAA Air Resources Laboratory  
June 15-18, 2021

## **Day 2, Introduction (9:00 – 9:15)**

### **Dr. Mark Cohen, Lead Scientist, HYSPLIT Modeling Group**

- ☐ **Agenda for today**
- ☐ **Quick recap of logistics**
- ☐ **What height to start a back-trajectory?**
- ☐ **Different ways to use HYSPLIT**
- ☐ **... And then, on to the course!**

Workshop guidance and resources posted at

[Workshop Web Page](#)

[https://www.ready.noaa.gov/  
register/HYSPLIT\\_hyagenda.php](https://www.ready.noaa.gov/register/HYSPLIT_hyagenda.php)

... this Intro presentation available as a  
Handout in Go-to-Webinar , and will  
also be put on Workshop Web Page

# Agenda – Day 1

UTC	EDT	Agenda Item
13:00 – 13:15	09:00 – 09:15	Welcome, Introduction and Logistics
13:15 – 14:00	09:15 – 10:00	1. Installing HYSPLIT
14:00 – 14:10	10:00 – 10:10	Break
14:10 – 14:50	10:10 – 10:50	2. Testing the installation
14:50 – 15:00	10:50 – 11:00	Break
15:00 – 15:45	11:00 – 11:45	3. Gridded meteorological data sets
15:45 – 16:30	11:45 – 12:30	Break
16:30 – 18:00	12:30 – 14:00	4. Trajectory calculations
18:00 – 18:15	14:00 – 14:15	Break
18:15 – 19:30	14:15 – 15:30	5. Trajectory options
19:30 – 19:40	15:30 – 15:40	Break
19:40 – 20:45	15:40 – 16:45	6. Trajectory statistics
20:45 – 21:00	16:45 – 17:00	First day wrap-up

# Agenda – Day 2

UTC	EDT	Agenda Item
13:00 – 13:15	09:00 – 09:15	Comments / questions from previous day
13:15 – 14:45	09:15 – 10:45	7. Air Concentration Calculations
14:45 – 15:00	10:45 – 11:00	Break
15:00 – 16:30	11:00 – 12:30	8. Configuring the CAPTEX simulation
16:30 – 17:30	12:30 – 13:30	Break
17:30 – 19:00	13:30 – 15:00	9. Air Concentration Parameter Sensitivity
19:00 – 19:15	15:00 – 15:15	Break
19:15 – 20:00	15:15 – 16:00	10. Alternate Display Options
20:00 – 20:45	16:00 – 16:45	11. Pollutant Transformations and deposition <i>(start this section if time permits)</i>
20:45 – 21:00	16:45 – 17:00	Second day wrap-up / questions

# Agenda – Day 3

UTC	EDT	Agenda Item
13:00 – 13:15	09:00 – 09:15	Comments / questions from previous day
13:15 – 14:15	09:15 – 10:15	<b>11. Pollutant Transformations and deposition</b> <i>(start today or continue from yesterday)</i>
14:15 – 14:30	10:15 – 10:30	Break
14:30 – 16:00	10:30 – 12:00	<b>12. Air Concentration Uncertainty</b>
16:00 – 17:00	12:00 – 13:00	Break
17:00 – 18:00	13:00 – 14:00	<b>13. Source Attribution Methods</b>
18:00 – 18:15	14:00 – 14:15	Break
18:15 – 19:15	14:15 – 15:15	<b>13. Source Attribution Methods</b> <i>(continued)</i>
19:15 – 19:30	15:15 – 15:30	Break
19:30 – 20:45	15:30 – 16:45	<b>14. Wildfire Smoke and Dust Storms</b>
20:45 – 21:00	16:45 – 17:00	Third day wrap-up / questions

# Agenda – Day 4

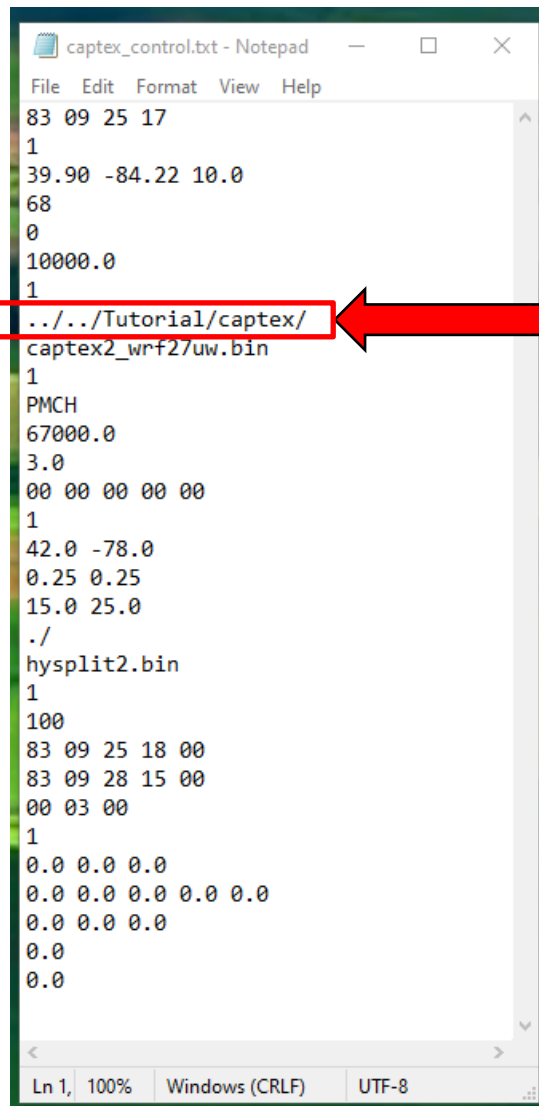
UTC	EDT	Agenda Item
13:00 – 13:15	09:00 – 09:15	Comments / questions from previous day
13:15 – 14:45	09:15 – 10:45	15. Radioactive Pollutants and Dose
14:45 – 15:00	10:45 – 11:00	Break
15:00 – 16:30	11:00 – 12:30	16. Volcanic Eruptions with Gravitational Settling
16:30 – 17:30	12:30 – 13:30	Break
17:30 – 18:30	13:30 – 14:30	17. Custom Simulations
18:30 – 18:45	14:30 – 14:45	Break
18:45 – 19:45	14:45 – 15:45	Questions and answer (Q & A) session with course instructor Roland Draxler
19:45 – 20:00	15:45 – 16:00	Final course wrap-up



## Yes, we know it is going fast, and might seem too fast for some

- Normally we give Roland the slowest computer possible, but...
- It *is* hard to listen, watch, and do your own hand's on modeling
- One shortcut that might helpful: Whenever the Tutorial says to save a CONTROL or SETUP.CFG file in your working directory for later use, we have also put versions of those same files in: Tutorial > files
  - May need some adjustment, depending on where you put HYSPLIT and the Tutorial on your computer, but much of what you need is there
- At some points, ok to watch as “demo” and then you can go back and do sections of Tutorial on your own; the Tutorial is designed to be done independently, and self-paced, so this is ok
- What you are getting, though, in this Workshop, different from doing the Tutorial on your own, are Roland's insights and guidance. So in some cases, might be best to listen and watch, rather than get too far behind?
- Also, we are making daily recordings, and you can watch these once they are ready, and you can pause them when you need to catch up





```

captex_control.txt - Notepad
File Edit Format View Help
83 09 25 17
1
39.90 -84.22 10.0
68
0
10000.0
1
../../Tutorial/captex/
captex2_wrf27uw.bin
1
PMCH
67000.0
3.0
00 00 00 00 00
1
42.0 -78.0
0.25 0.25
15.0 25.0
./
hysplit2.bin
1
100
83 09 25 18 00
83 09 28 15 00
00 03 00
1
0.0 0.0 0.0
0.0 0.0 0.0 0.0 0.0
0.0 0.0 0.0
0.0
0.0
Ln 1, 100% Windows (CRLF) UTF-8

```

- ❑ This path, to the location of the meteorological data file, may not be correct for your situation, depending on where you put (and if you renamed) the Tutorial folder
- ❑ If you've brought in one of the provided CONTROL files, and you need to adjust it, you do this from within the HYSPLIT Graphical User Interface (GUI) by reselecting the meteorological data files.
- ❑ And then, once you do this, you will want to save the CONTROL file so you can use it again.

# Quick Recap of Logistics

## Using the Go-to-Webinar Interface

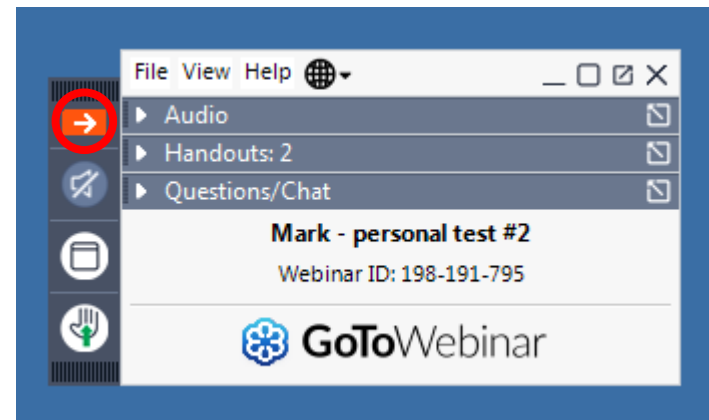
*...relevant if you are live-streaming the Workshop, but not if you are just viewing a recording...*

# Using the Go-to-Webinar Interface



**Click the red  
arrow to toggle  
between hidden  
and not-hidden**

**If the Go-to-Webinar  
Control Panel is  
hidden (minimized) it  
will look like this**

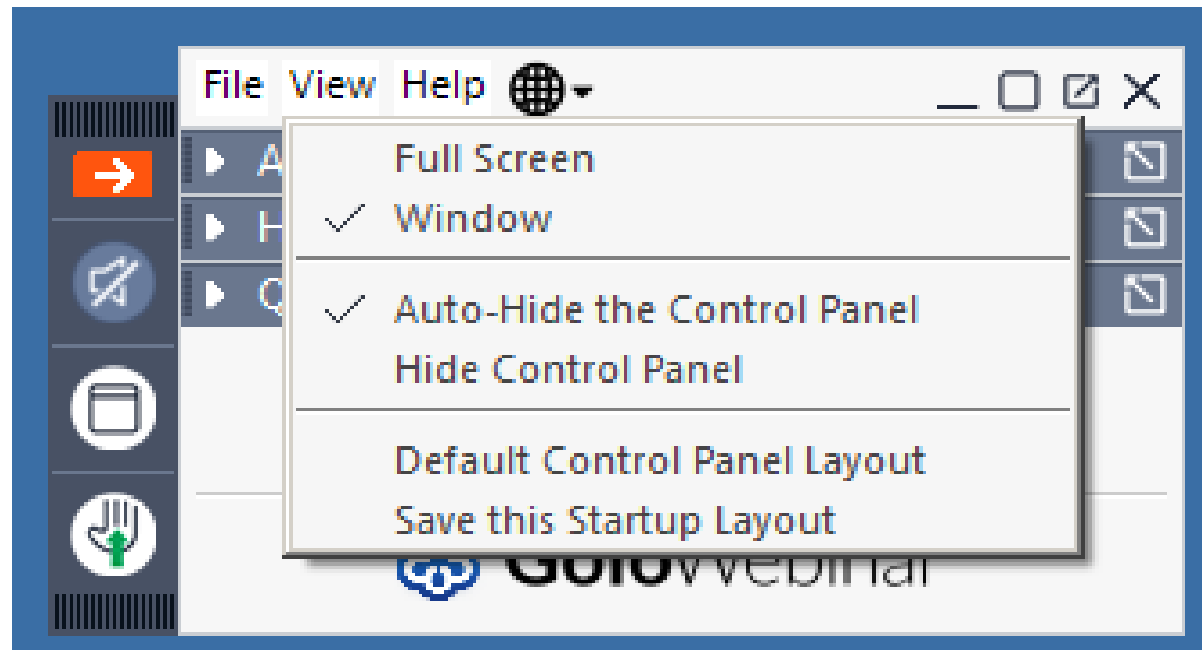


**If not hidden, the Go-  
to-Webinar Control  
Panel will look  
something like this**

# Using the Go-to-Webinar Interface

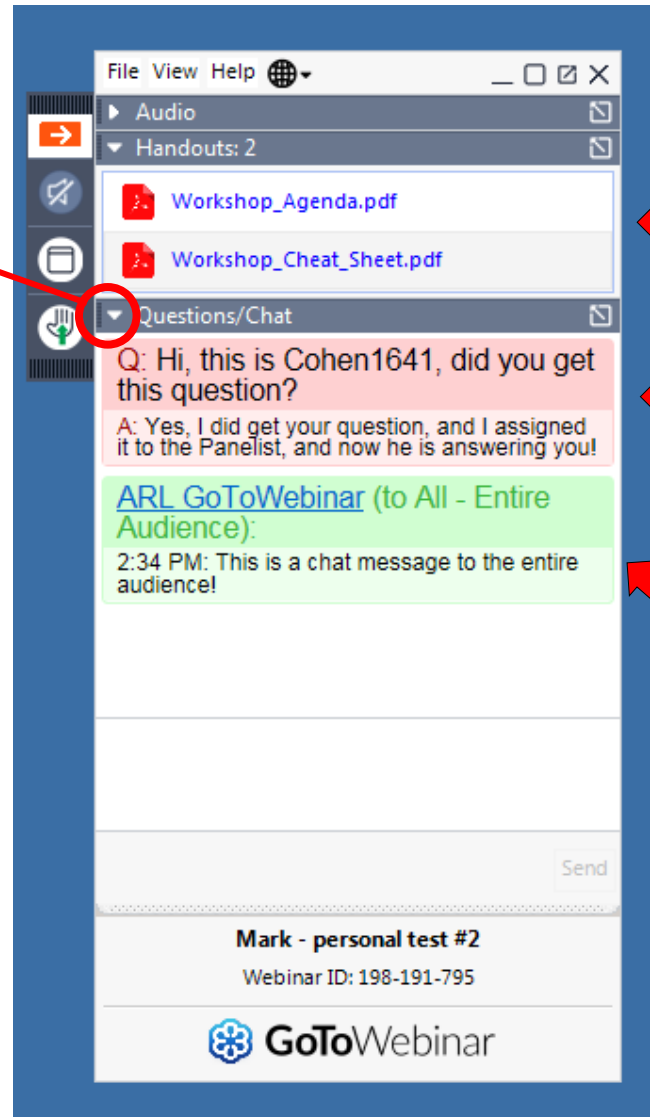
Use the View drop-down menu, for example:

- ✓ to autohide control panel or not
- ✓ to restore the basic default layout if something disappears



# Using the Go-to-Webinar Interface

By toggling the little triangle by each Control Panel section, you can expand it or contract it

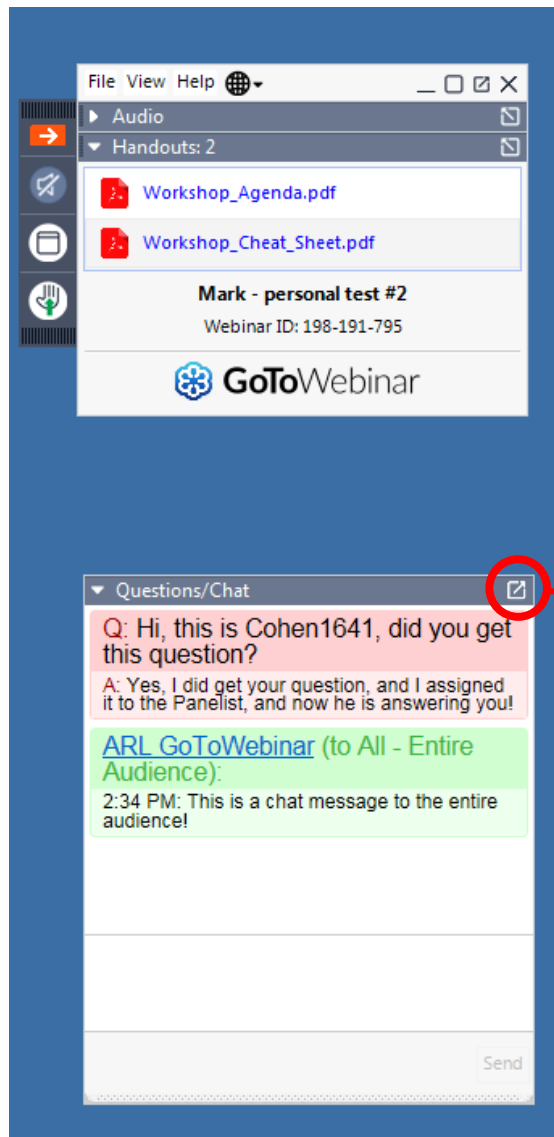


We will put important handouts in this section

When you ask questions of the staff, your questions and answers will be shown in this section

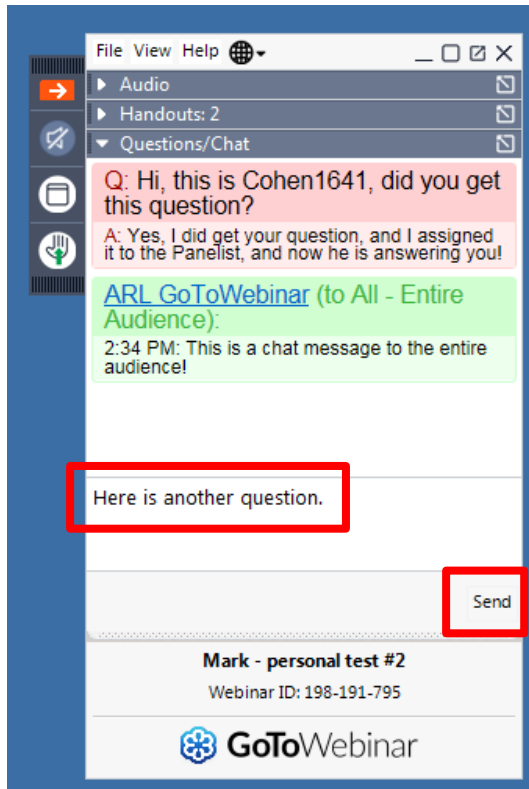
Or when the staff sends the audience a message, you will also see it here

# Using the Go-to-Webinar Interface

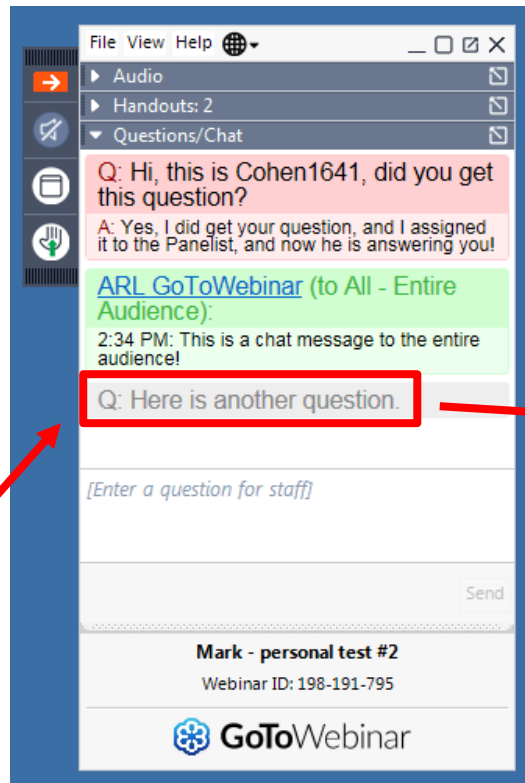


By toggling the little box in the upper right-hand corner of a given section, you can undock it or redock it

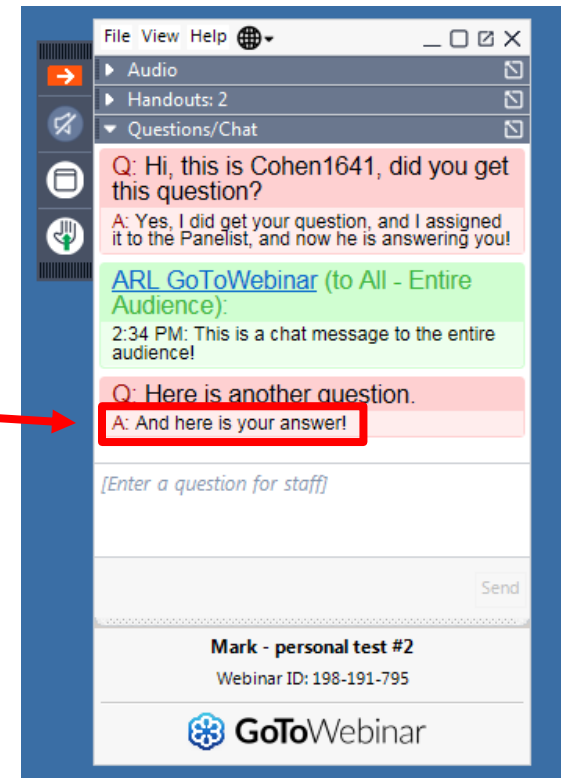
# Using the Go-to-Webinar Interface



To ask a question, you type in the empty box, and then hit “send”



The question you asked should then show up in *your* Control Panel

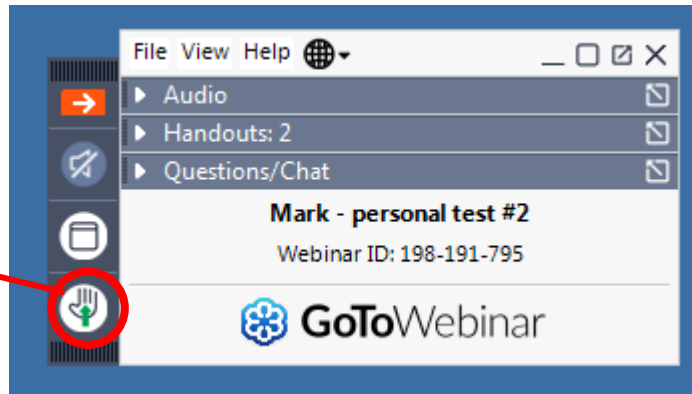


When we answer it, the answer will show up in *your* Control Panel



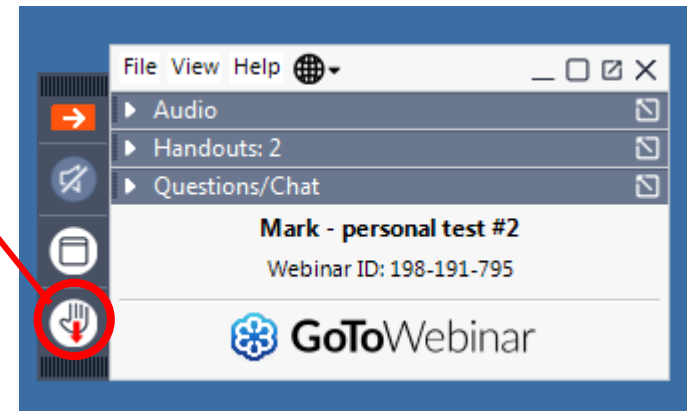
# Using the Go-to-Webinar Interface

Sometimes we will ask for a show of hands on a particular question. You click the little hand icon to raise your hand



To lower your hand, you click again on the same icon.

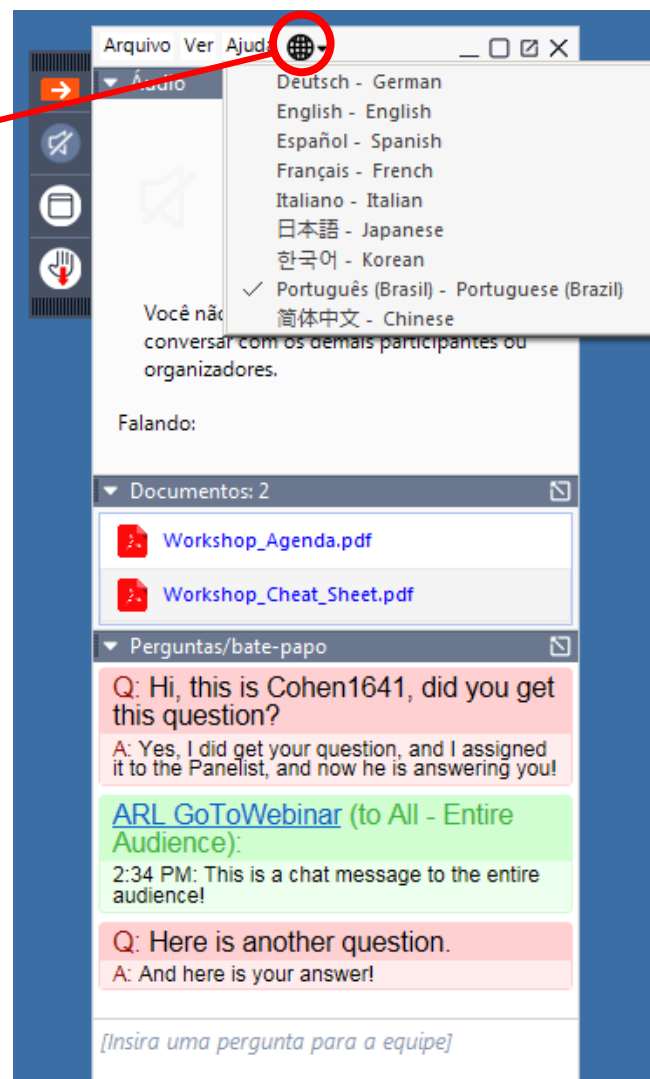
*Normally, after we get the answers, we will automatically lower everyone's hand*



*You are in listen-only mode, so you don't raise your hand to ask a question.*

# Using the Go-to-Webinar Interface

You can click on the “globe” icon to change the language of the Control Panel. Although Questions and Answers will be in English

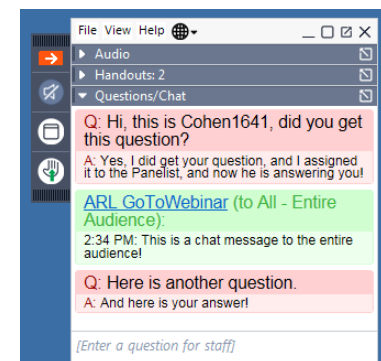


# Asking Questions


# Asking Questions

- Ask general questions about the Webinar or Go-to-Webinar in the Control Panel that was just discussed

*...if viewing a recording, can ask  
general questions by emailing  
**arl.webmaster@noaa.gov***



- Ask questions about HYSPLIT and the Tutorial in the HYSPLIT Forum







**HYSPLIT Forum: [hysplitbbs.arl.noaa.gov](https://hysplitbbs.arl.noaa.gov)**  
A Forum for HYSPLIT Dispersion Model Users to Communicate Questions, Problems, and Ideas for Upgrades, etc.

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### 2021 HYSPLIT Workshop Questions

FORUM	TOPICS	POSTS	LAST POST
 1. Installing HYSPLIT	1	1	<b>Installing HYSPLIT using the ...</b> by <a href="#">sonny.zinn</a>  June 8th, 2021, 1:46 pm
 2. Testing the installation	1	4	<b>Re: GSView requesting for ver...</b> by <a href="#">sonny.zinn</a>  June 8th, 2021, 6:24 am

# Asking Questions

If you have not already registered  
for the HYSPLIT Forum, you can  
do so easily by clicking on the  
“Register” icon at  
<https://hysplitbbs.arl.noaa.gov/>

A screenshot of the top section of the HYSPLIT Forum website. It features a blue header bar with the phpBB logo on the left, the forum name and URL in the center, and a search bar on the right. Below the header is a light blue navigation bar containing links for "Quick links", "FAQ", "Board index", "Register", and "Login". The "Register" button is highlighted with a red square.

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It is currently June 7th, 2020, 7:32 pm

# Asking Questions



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It is currently June 18th, 2020, 6:36 pm

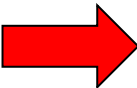
Last visit was: June 16th, 2020, 10:13 am


[Mark forums read](#)

HYSPLIT	TOPICS	POSTS	LAST POST
 <b>Users</b> General questions and postings pertaining to the use of HYSPLIT regardless of the platform. For platform specific questions, use the HYSPLIT Platform forums.	190	715	<b>Re: Meteorological Data</b> by <a href="#">barbara.stunder</a> May 26th, 2020, 8:52 am
 <b>Developers</b> Questions and postings pertaining to the development of HYSPLIT, feature enhancements, and HYSPLIT internals. HYSPLIT source code and algorithms are discussed here.	19	70	<b>Trying to Recreate This image</b> by <a href="#">munleyj</a> May 11th, 2020, 9:48 am
 <b>Bugs</b> Post any defects you find in the HYSPLIT software here. The HYSPLIT Developers carefully monitor this list and will work diligently to repair any reported problems. When posting a bug report, please specify both the HYSPLIT version and operating system you are using.	42	145	<b>Re: question about DATEM form...</b> by <a href="#">lida</a> May 18th, 2020, 9:37 pm
 <b>Announce</b> Announcements pertaining to HYSPLIT, training materials, dispersion related jobs or research positions, or related software. This list is moderated and will not be used for any discussion.	25	47	<b>Re: TAPPAS</b> by <a href="#">alicecc</a> January 27th, 2020, 12:26 pm

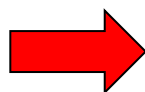
⋮


 in the atmosphere. This section is also to facilitate collaborations between researchers involved in chemical transport and dispersion.			January 22nd, 2020, 3:55 am
 <b>Radiological</b> Post questions, comments and links to research (research papers, web sites, etc) involving HYSPLIT and radiological nuclides. This section is also to facilitate collaborations between researchers involved in radiological nuclide transport and dispersion.	12	38	<b>Re: Fukushima Calculation</b> by <a href="#">ariel.stein</a> September 20th, 2018, 9:25 am
 <b>Cluster Analysis</b> Topics about the trajectory clustering program for HYSPLIT.	31	133	<b>Re: Generate cluster trajecto...</b> by <a href="#">barbara.stunder</a> August 26th, 2019, 7:35 am



FORUM	TOPICS	POSTS	LAST POST
 <b>HYSPLIT Workshop</b>	17	34	<b>? Re: Moderator test</b> by <a href="#">alicecc</a> June 12th, 2020, 11:30 am

# Asking Questions











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



## HYSPLIT Workshop

FORUM	TOPICS	POSTS	LAST POST
 <b>2021 HYSPLIT Workshop Questions</b>	2	5	<b>Installing HYSPLIT using the ...</b> by <a href="#">sonny.zinn</a>  June 8th, 2021, 1:46 pm
 <b>2020 HYSPLIT Workshop Questions</b> Questions from the 2020 Online HYSPLIT Workshop.	88	349	<b>Re: ImageMagick version - up ...</b> by <a href="#">nobella</a>  April 14th, 2021, 12:22 am
 <b>2019 HYSPLIT Workshop Questions</b> During the four weeks of the 2019 HYSPLIT Workshop, users will be able to post questions on the week's topics to this Forum and model developers will try to answer them as soon as possible.	3	5	<b>Re: Depositions calculated wi...</b> by <a href="#">ariel.stein</a>  June 17th, 2019, 3:58 pm

[New Topic](#) 





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TOPICS	REPLIES	VIEWS	LAST POST
 <b>2021 Online Hysplit Workshop</b> by <a href="#">sonny.zinn</a> » April 19th, 2021, 11:33 am	0	819	by <a href="#">sonny.zinn</a>  April 19th, 2021, 11:33 am
 <b>How to get registered ?</b> by <a href="#">zaimiscd</a> » February 27th, 2021, 3:22 pm	1	577	by <a href="#">sonny.zinn</a>  March 1st, 2021, 8:34 am
 <b>Hello</b>			by <a href="#">barbara.stunder</a> 

# Asking Questions

<https://hysplitbbs.arl.noaa.gov/viewforum.php?f=57>






















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 3. Gridded meteorological data files	0	0	No posts
 4. Trajectory calculations	0	0	No posts
 5. Trajectory options	0	0	No posts
 6. Trajectory statistics	0	0	No posts
 7. Air concentration calculations	0	0	No posts
 8. Configuring the CAPTEX simulation	0	0	No posts
 9. Air concentration parameter sensitivity	0	0	No posts
 10. Alternate display options	0	0	No posts
 11. Pollutant transformations and deposition	0	0	No posts
 12. Air concentration uncertainty	0	0	No posts
 13. Source attribution methods	0	0	No posts
 14. Wildfire smoke and dust storms	0	0	No posts
 15. Radioactive pollutants and dose	0	0	No posts
 16. Volcanic eruptions with gravitational settling	0	0	No posts
 17. Custom simulations	0	0	No posts

You can  
post your  
question in  
the  
appropriate  
section,  
based on  
where in  
the Tutorial  
your  
question  
refers to.



# Asking Questions

You can look to see if there already is a similar question, and if not, you can create a **New Topic**



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


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## 1. Installing HYSPLIT

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TOPICS	REPLIES	VIEWS	LAST POST
 <a href="#">I cannot Run Hysplit after following the installation</a> by Cares » June 18th, 2020, 12:30 pm	1	3	by <a href="#">MarkCohen</a>  June 18th, 2020, 6:57 pm
 <a href="#">Desktop icon Run Hysplit not working ?</a> by Claudia_Rivera » June 18th, 2020, 2:01 pm	0	0	by <a href="#">Claudia_Rivera</a>  June 18th, 2020, 2:01 pm
 <a href="#">Failure in unzipping the contents of 'Tutorial.zip'</a> by flaviavieira » June 2nd, 2020, 10:02 am	3	300	by <a href="#">sonny.zinn</a>  June 9th, 2020, 1:45 pm
 <a href="#">tutorial/index.html not working</a> by kschwager » May 28th, 2020, 8:58 am	1	57	by <a href="#">sonny.zinn</a>  May 29th, 2020, 11:48 am

[New Topic](#)


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# Asking Questions

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## 1. Installing HYSPLIT

POST A NEW TOPIC

Subject:

B I U Normal

Add your question text in this box.

Please avoid putting any links in your post.

Do not start any line with two dashes "--"

Smilies

BBCode is ON  
[img] is ON  
[flash] is OFF  
[url] is ON  
Smilies are ON

Save draft Preview Submit

Options Attachments Poll creation

☐ Disable BBCode  
☐ Disable smilies  
☐ Do not automatically parse URLs  
☒ Attach a signature (signatures can be altered via the UCP)  
☐ Notify me when a reply is posted  
☐ Lock topic

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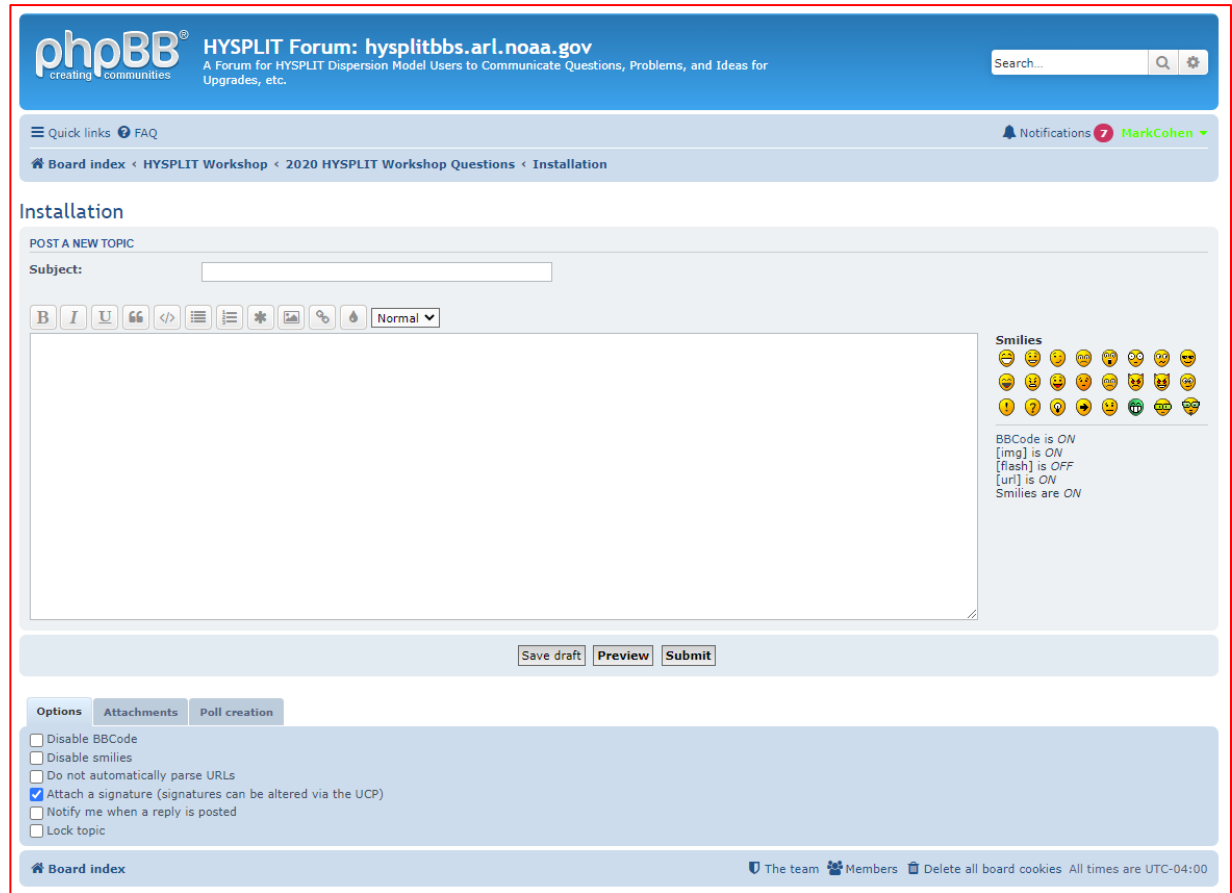
The team Members Delete all board cookies All times are UTC-04:00

you can add attachments, e.g., one or more screen shots, and/or a CONTROL file and/or a SETUP.CFG file

Once you submit your post, it can be approved and then answered by ARL staff

# Asking Questions

- You can ask more detailed questions, e.g., can attach screen shots
- We can provide more detailed answers
- There can be an exchange back and forth, if needed
- Can see other questions – in case you have a similar question
- We can give you a link to the answer to a similar question
- Accessible to people just viewing the recordings

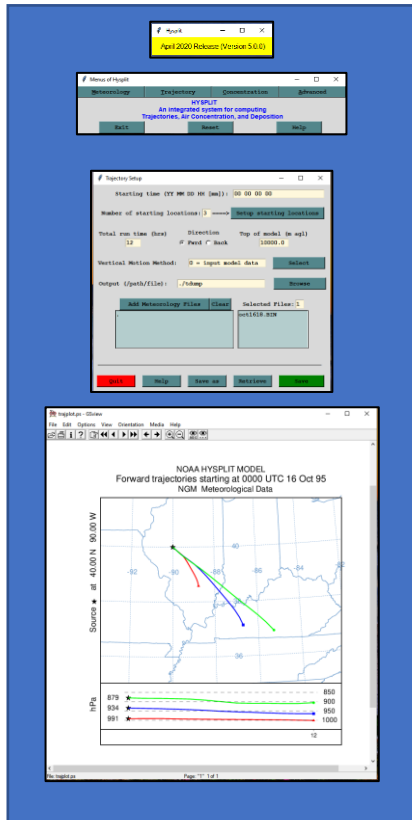


The screenshot shows the phpBB forum interface for HYSPLIT Forum. The header includes the forum name and a search bar. The main content area is titled "Installation" and contains a "POST A NEW TOPIC" form. The form includes a "Subject:" field, a rich text editor with various formatting tools (bold, italic, underline, link, etc.), and a "Smilies" section with a grid of smiley icons. Below the form are buttons for "Save draft", "Preview", and "Submit". At the bottom, there are tabs for "Options", "Attachments", and "Poll creation", followed by a list of checkboxes for forum settings (e.g., "Disable BBCode", "Attach a signature"). The footer shows navigation links like "Board index" and "The team".

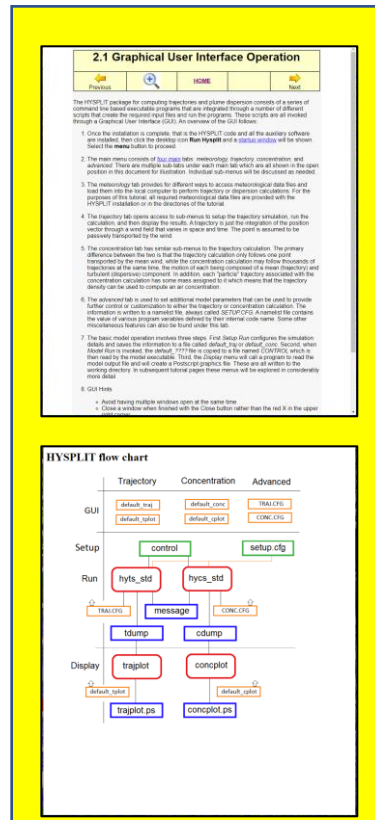
# Screen Considerations

# Screen Considerations

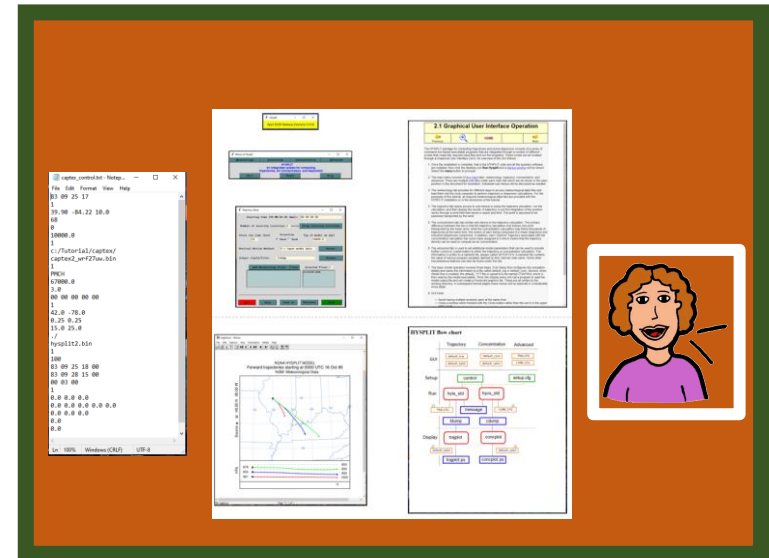
Screen area devoted  
to your *own* hands-on  
HYSPLIT modeling



Screen area devoted  
to your *own* viewing  
of Tutorial



Screen area  
devoted to viewing  
the Webinar



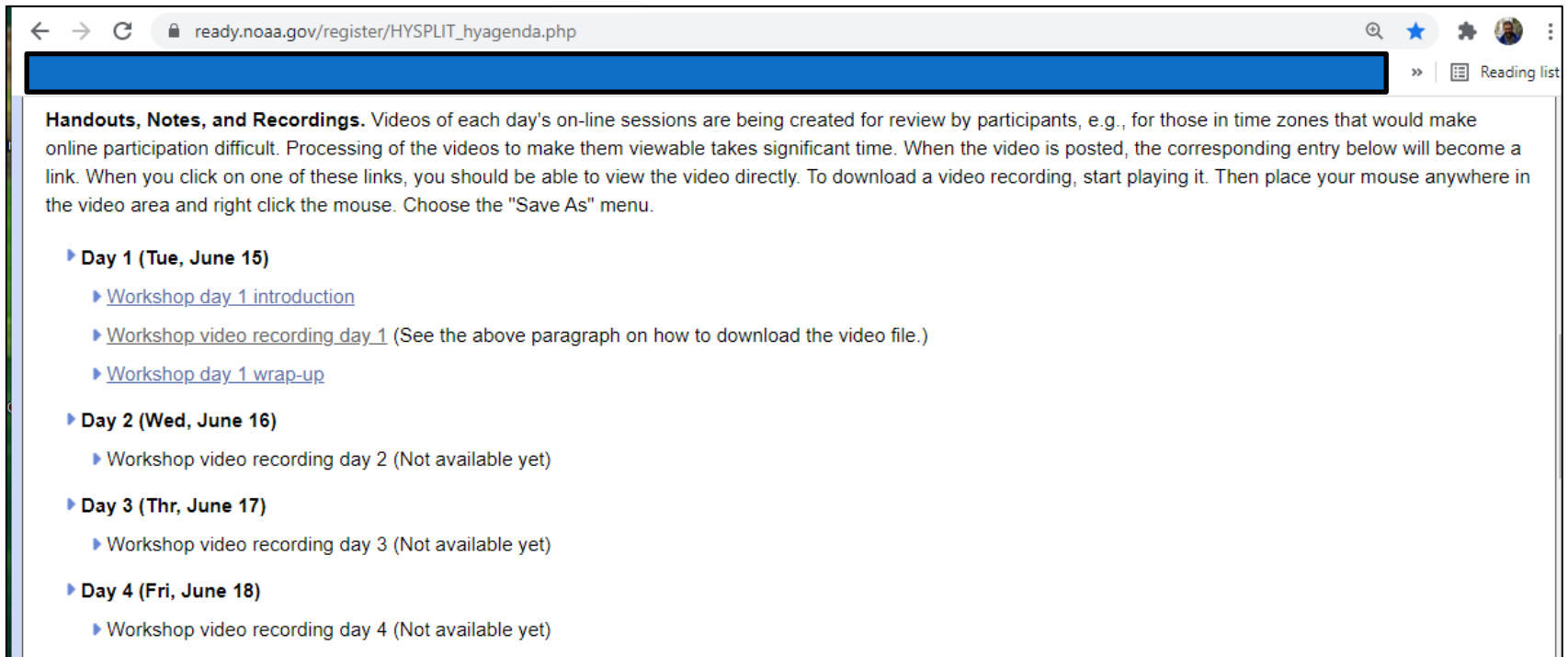
*We recommend that a 2nd screen be used, if this is possible, e.g., to display the Workshop Webinar video. In this way, the participant can carry out their hands-on HYSPLIT work, in conjunction with the Workshop, and still conveniently view the ongoing, associated instructions.*

# Recordings

# Recordings

Access recordings from the Workshop Web Page:  
[https://www.ready.noaa.gov/register/HYSPLIT\\_hyagenda.php](https://www.ready.noaa.gov/register/HYSPLIT_hyagenda.php)

- ❑ Recordings of each day's on-line sessions are being created, *but processing typically takes at least 2-4 hours* -- once the video is posted on our site, the corresponding item in the list below will turn into a link you can click to view



The screenshot shows a web browser window with the address bar displaying [ready.noaa.gov/register/HYSPLIT\\_hyagenda.php](https://www.ready.noaa.gov/register/HYSPLIT_hyagenda.php). The page content includes a blue header bar, a search icon, a star icon, and a user profile icon. Below the header, there is a section titled "Handouts, Notes, and Recordings" with a paragraph explaining that videos are being created for review and that processing takes significant time. The page lists four days of the workshop, each with a list of items:

- Day 1 (Tue, June 15)**
  - ▶ [Workshop day 1 introduction](#)
  - ▶ [Workshop video recording day 1](#) (See the above paragraph on how to download the video file.)
  - ▶ [Workshop day 1 wrap-up](#)
- Day 2 (Wed, June 16)**
  - ▶ Workshop video recording day 2 (Not available yet)
- Day 3 (Thr, June 17)**
  - ▶ Workshop video recording day 3 (Not available yet)
- Day 4 (Fri, June 18)**
  - ▶ Workshop video recording day 4 (Not available yet)

**What height should you start a back-trajectory from, if you are trying to see where air masses impacting a given measurement came from?**



# What height should you start a back-trajectory at?

## CASE 1:

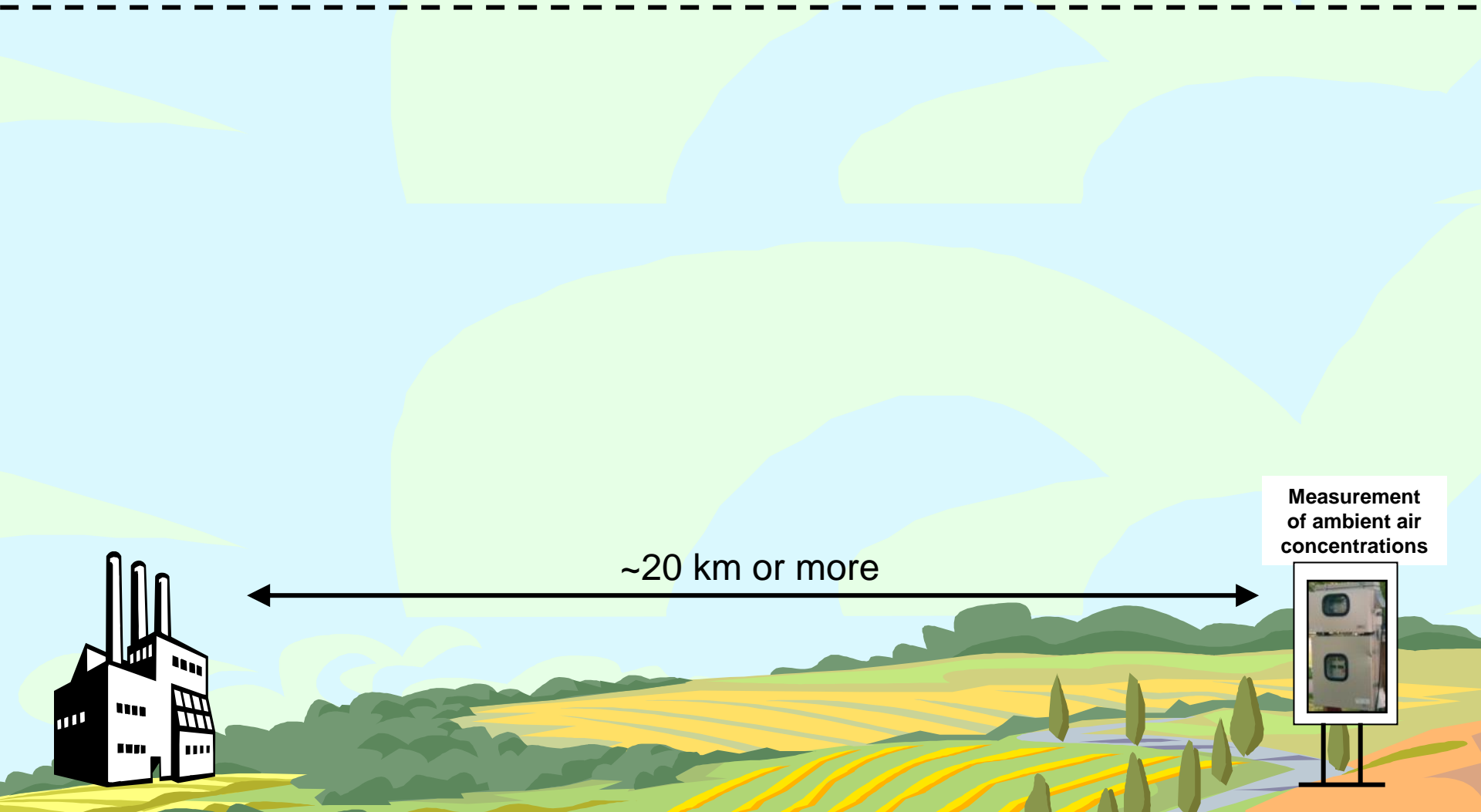
- relatively simple terrain
- at least ~20 km or more away from any major sources

## CASE 2:

- at the top of a relatively isolated mountain

## CASE 1:

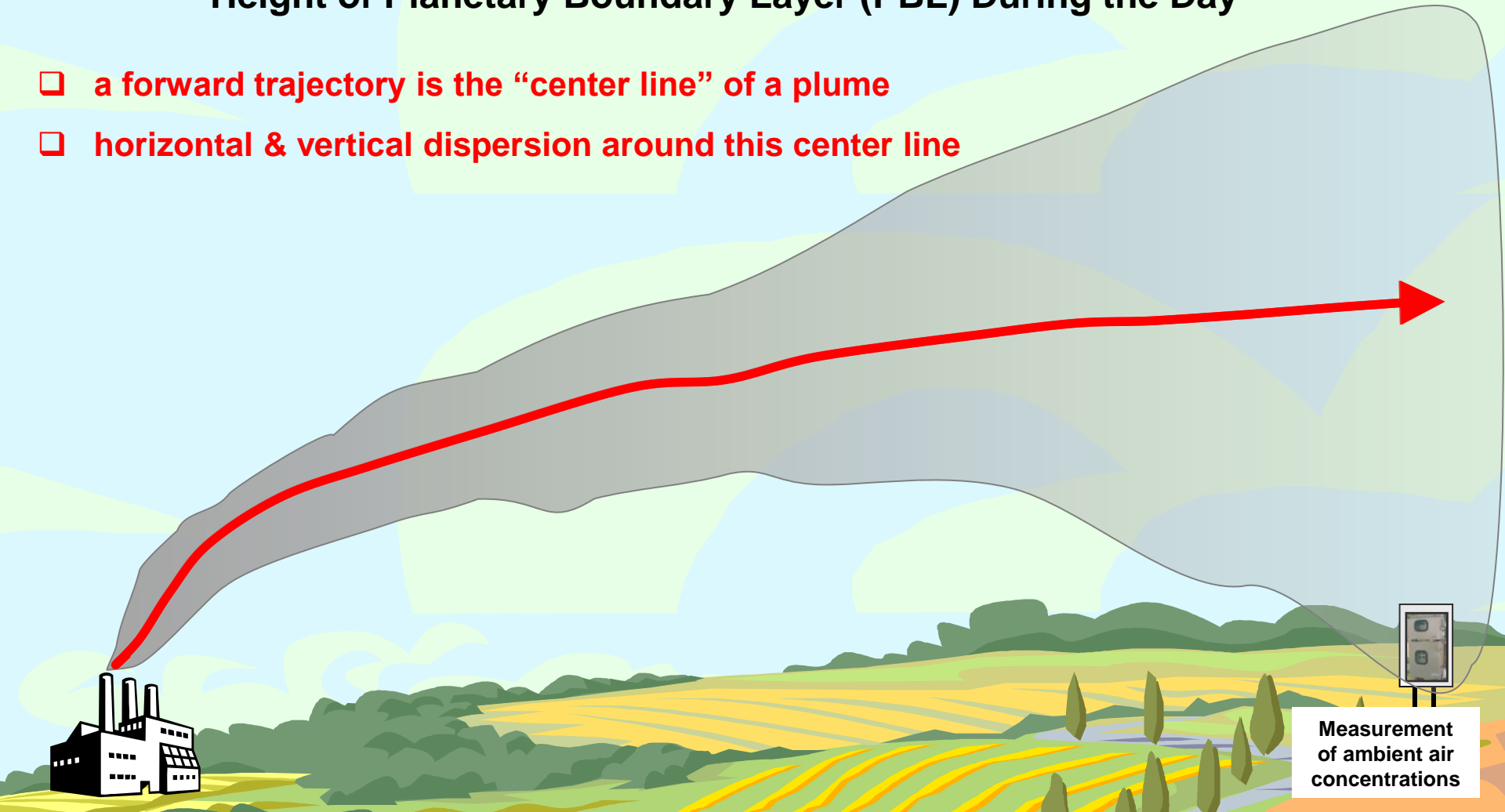
- relatively simple terrain
- at least ~20 km or more away from any major sources



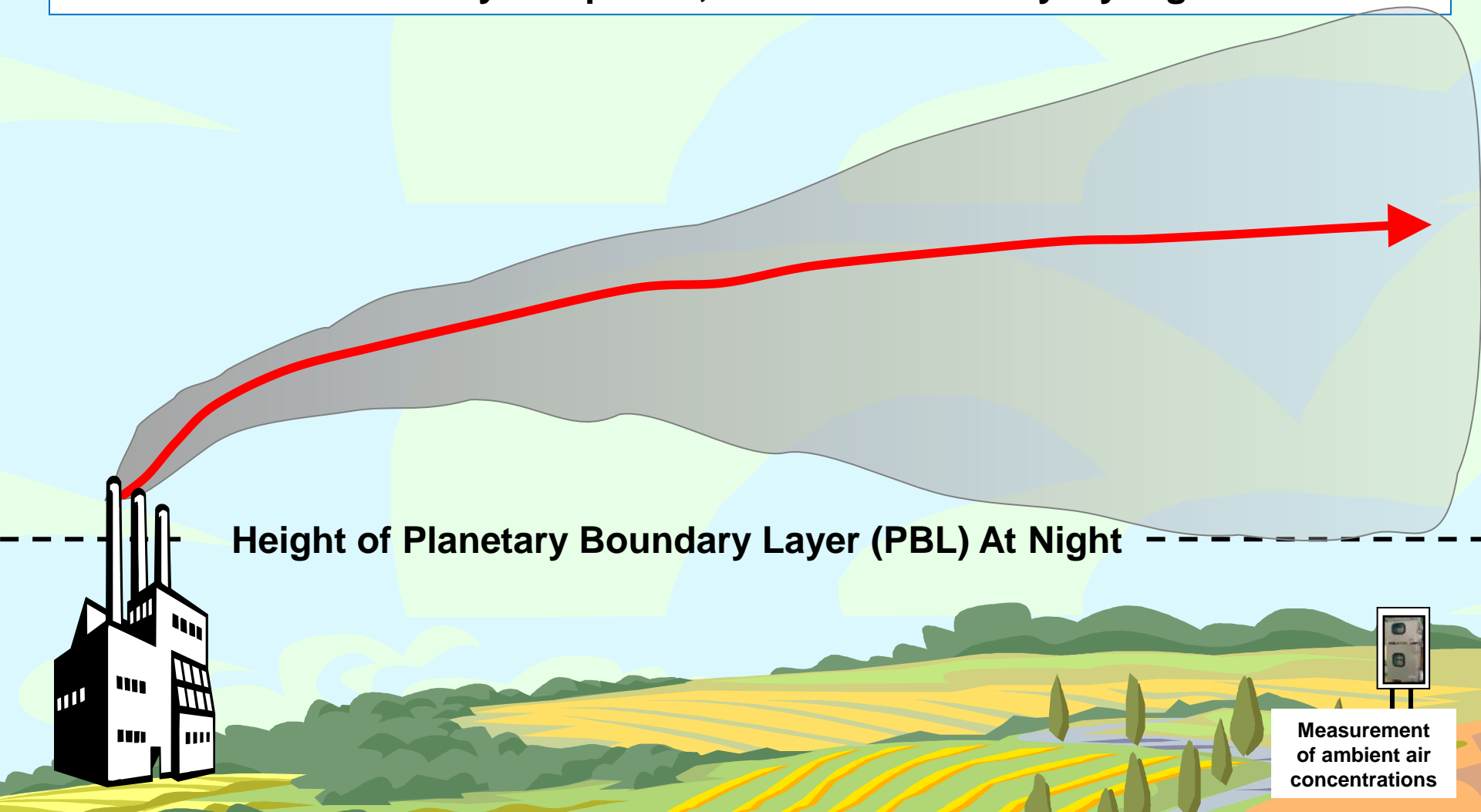
Greater than ~20km from the source,  
if the forward trajectory from the source is within the PBL,  
then the source can impact the measurement site,  
even if the trajectory endpoint near the site is not at the height of the sampler...  
This is because the PBL is relatively well-mixed during the day.

## ----- Height of Planetary Boundary Layer (PBL) During the Day -----

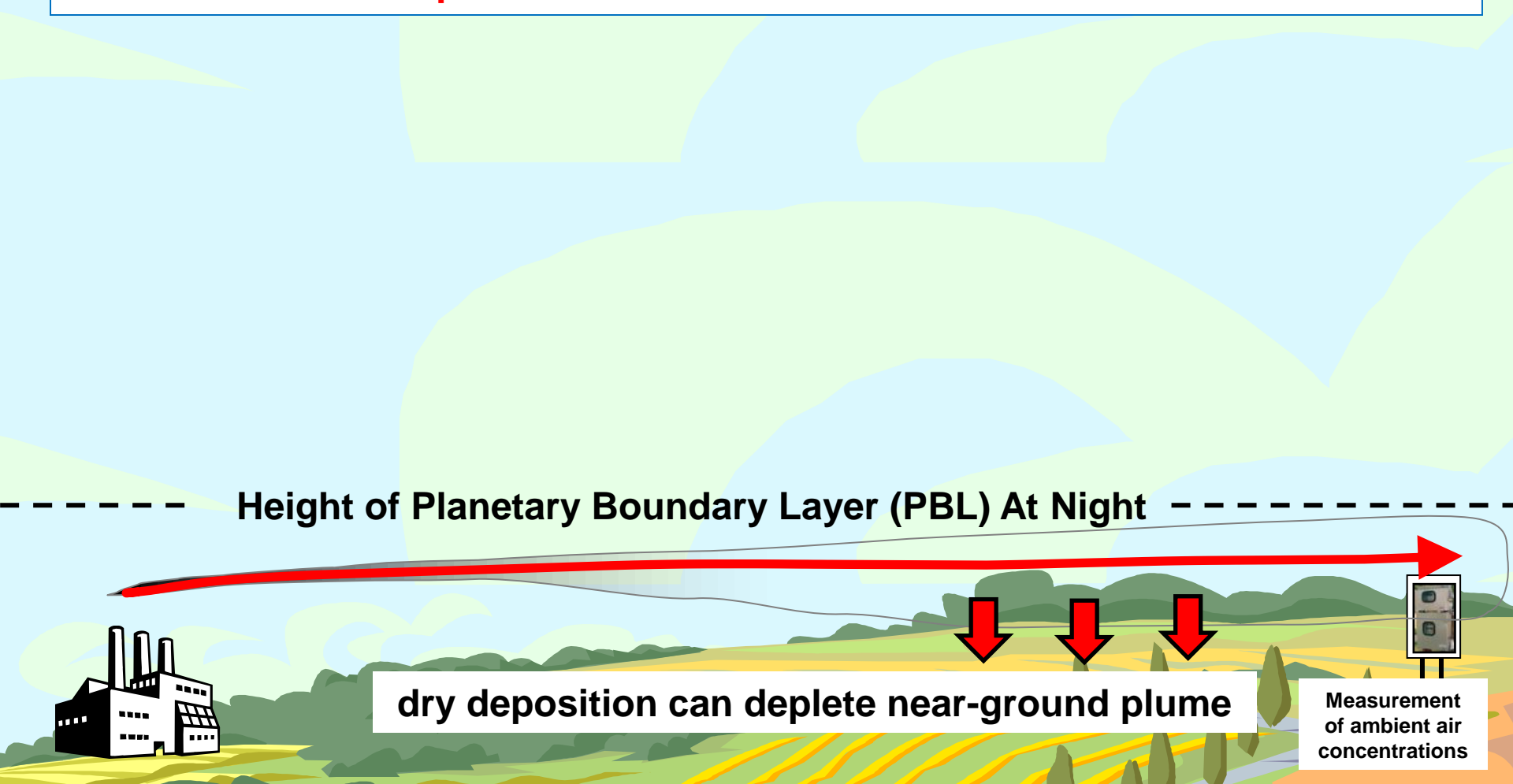
- ❑ a forward trajectory is the “center line” of a plume
- ❑ horizontal & vertical dispersion around this center line



- ❑ At night, the Planetary Boundary Layer (PBL) is generally much shallower
- ❑ Emissions from an elevated stack *may* be emitted above the PBL
- ❑ In this case, there *may* be little impact on a ground-based measurement site until the next daytime period, when the boundary layer grows.



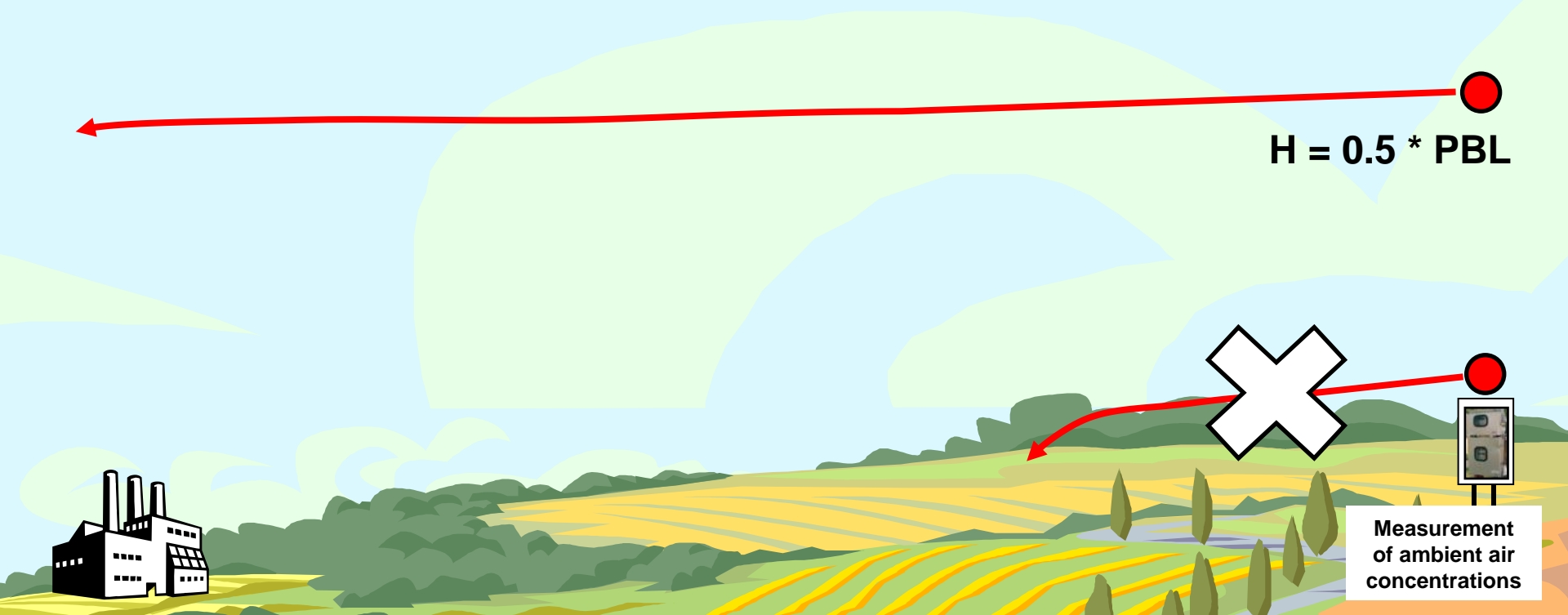
- ❑ At night, the Planetary Boundary Layer (PBL) is generally much shallower
- ❑ Emissions from a relatively low stack may be emitted within the PBL
- ❑ Note, if the pollutant dry deposits relatively rapidly, by the time the plume reaches the receptor, there may be little pollutant left... **Back-trajectories do not include deposition!**



- ❑ What are the implications of these ideas for back-trajectories?
- ❑ What HEIGHT should one start a back-trajectory?
- ❑ If you start very low to the ground, e.g., at the sampler height, the trajectories often hit the ground... This may not give a representative back-trajectory
- ❑ “best” starting height for back-trajectories may be from the middle of the Planetary Boundary Layer
- ❑ It can be useful to start trajectories at different heights to see what influence the starting height has on the results

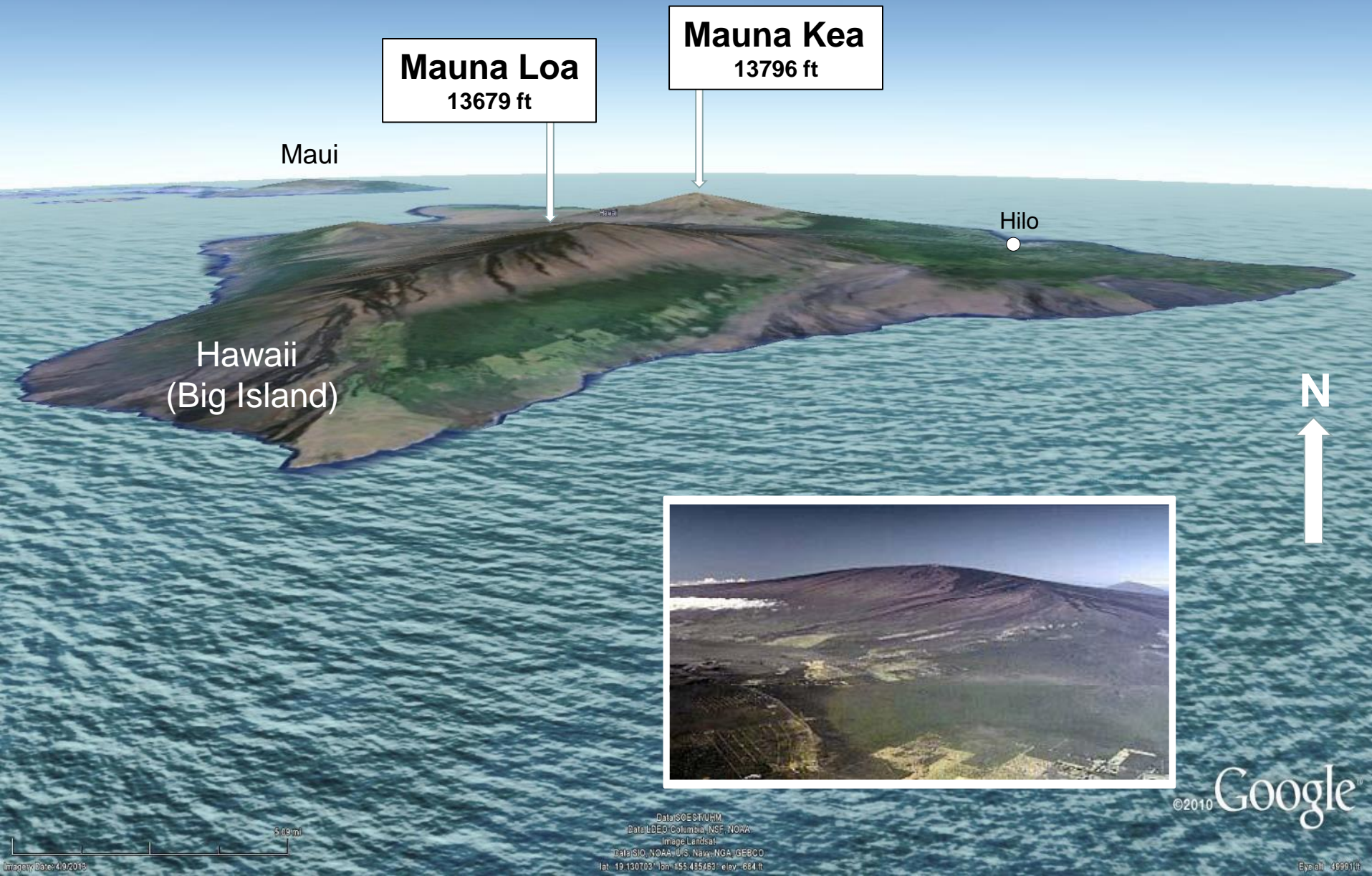
--- PBL Height ---

$$H = 0.5 * PBL$$



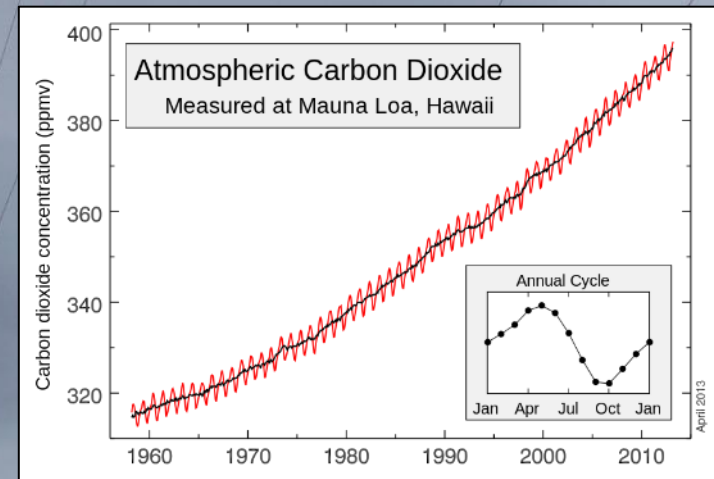


## CASE 2: at or near the top of a relatively isolated mountain





Mercury measurement  
instruments on roof and  
inside historic Keeling  
Building, near the  
summit of Mauna Loa



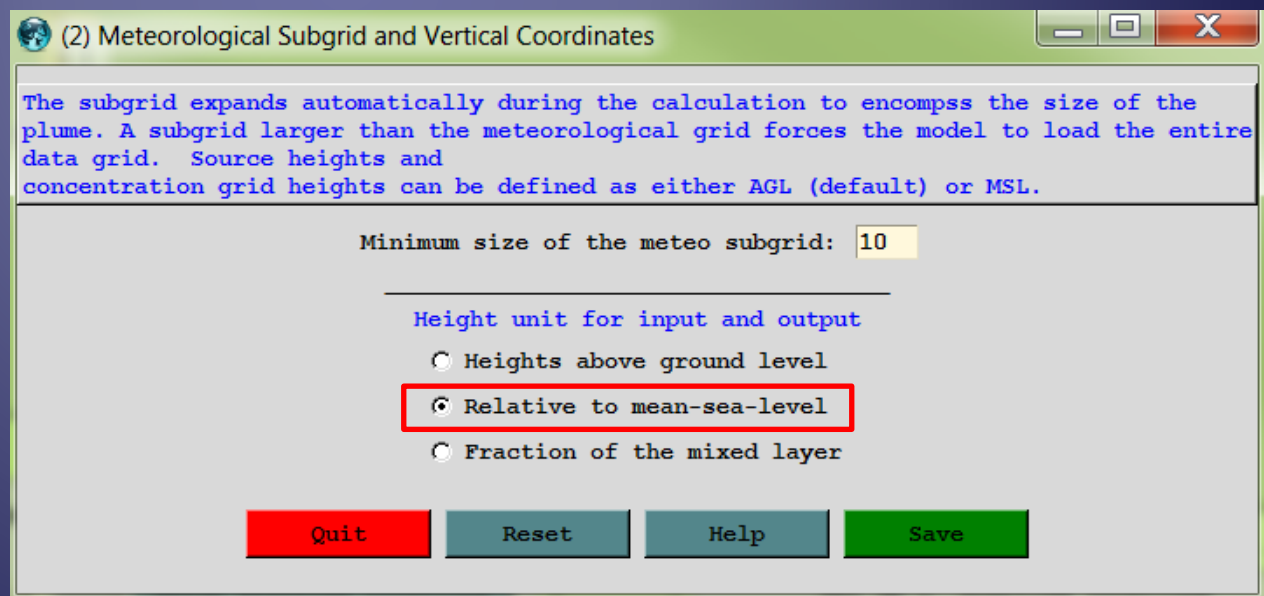


**Mercury  
measurement  
instruments on roof  
and inside historic  
Keeling Building,  
near the summit  
of Mauna Loa**



In this case, especially if sampling free-tropospheric air masses, would likely want to start the back-trajectory simply at the height of the summit above mean sea level.

- (1) Exact terrain height may not be that accurately characterized in the met data, so selecting a height Above Ground Level can be problematical
- (2) Use Advanced Menu to select “Relative to mean-sea-level”, and could then simply use the height of the summit



# Different Ways to Use HYSPLIT

# Different Ways to Use HYSPLIT

## 1. Online - READY Website: <https://www.ready.noaa.gov/index.php>

- Specialized applications (e.g., Volcanoes, Fires, Locusts, ...)
- Researcher access; public access
- Can use met data directly on our servers, without downloading it

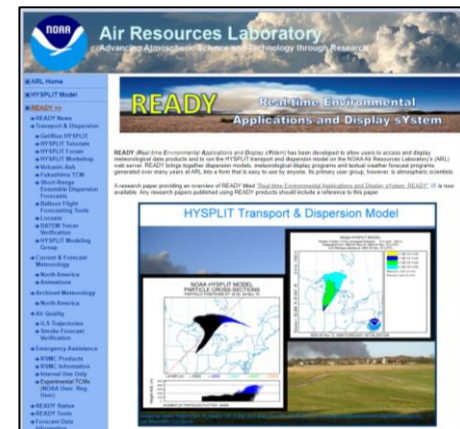
## 2. Download model (free) and run on your local computer using the Graphical User Interface (GUI)

- This Workshop deals almost exclusively with the GUI
- Menu driven, context sensitive help, integrated applications
- Can generally do more with the GUI than you can online, as we have imposed some limitations due to computational resource constraints
- Download (free) forecast and archive met data to run HYSPLIT

## 3. Use the same model you downloaded to run on your local computer using the Command Line (terminal) and scripts

- At a basic level, a script is just a series of command line entries
- More features available from command line / scripts than in GUI
- Re-do runs by re-running a script; easy to change parameters
- And you have a record of exactly what you did.

- **But the GUI is a great way to learn how to use HYSPLIT.** Most experienced users will use the GUI when trying something new, and only try a script once they understand what is happening in the GUI.



### 4.1 The Trajectory Calculation



```
echo "$syr $smo $sda $shr"    ">CONTROL
echo "1"                      ">>CONTROL
echo "$olat $olon $olvl"      ">>CONTROL
echo "$run"                   ">>CONTROL
echo "0"                      ">>CONTROL
echo "$ztop"                  ">>CONTROL
echo "1"                      ">>CONTROL
echo "$MET/"                  ">>CONTROL
echo "$data"                  ">>CONTROL
echo "$OUT/"                  ">>CONTROL
echo "tdump"                  ">>CONTROL
```

Thanks to the

**IT Team** and the **HYSPLIT Team**

of the NOAA Air Resources Laboratory  
for providing behind-the-scenes support  
throughout this Workshop

*...we will try our best to answer all of your questions,  
but we ask for your patience, as there are 100's of  
people in this Workshop and only a few of us...*

Course Instructor

**Roland Draxler**

NOAA Air Resources  
Laboratory (retired)

